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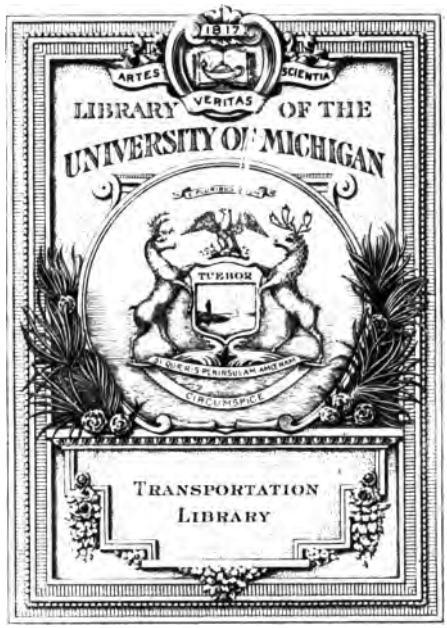
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REPORT

OF THE

COMMISSIONERS

APPOINTED BY JOINT RESOLUTIONS

OF THE

HONORABLE THE SENATE AND ASSEMBLY

OF THE

STATE OF NEW-YORK,

OF THE 13th & 15th MARCH, 1810,

TO EXPLORE THE ROUTE OF AN INLAND NAVIGATION

FROM HUDSON's RIVER TO LAKE ONTARIO

AND LAKE ERIE.

ALBANY:

PRINTED BY S. SOUTHWICK.

1811.

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REPORT.

THE Commissioners appointed by joint resolutions of the honorable Senate and Assembly of the state of New-York, of the 13th and 15th March, 1810, to explore the route of an inland navigation from Hudson's river to lake Ontario and lake Erie, beg leave to

Report,

THAT they have examined the country as critically as time and circumstances would permit, and caused surveys to be made for their better information.

They beg leave to observe, on the present navigation of the Mohawk river, Wood creek, Oneida lake, and the Oswego river, which extend from Schenectady to lake Ontario, (saving only a portage at the Falls, within twelve miles of Oswego) that experience has long since exploded in Europe the idea of using the beds of rivers for internal navigation, where canals are practicable. The reasoning on that subject, applies with greater force in America. For in the navigation of rivers, reliance must be had principally on the labour of men; whereas, along canals, the force employed is generally that of horses. But the labor of men is dearer, and the subsistence of horses cheaper in America than in Europe. Experience, moreover,

has, in this country, declared against following the course of rivers, more decidedly than in the old world; for there, notwithstanding the excellence of the highways, transportation is performed (between Rouen and Paris, for instance) in boats drawn up the river: but along the Mohawk, though the road from Schenectady to Utica is far from being good, it is frequently preferred to the river.

By the aid of canals, a good navigation (for boats) can unquestionably be made from Schenectady to the Falls in the Oswego river, twelve miles south of lake Ontario. From Schenectady to the Hudson, and from the Falls just mentioned, to the lake Ontario, a boat navigation is also practicable; but whether it be advisable, may deserve consideration.

A preliminary point to decide, is, whether by this route, vessels can be taken across, of size and form, to navigate with advantage, lake Ontario and Hudson's river; such, for instance, as sloops and schooners of fifty or sixty tons.

The commissioners believe this to be impracticabl from the want of water at the summit level. Wheth a sufficient supply even for boats can be obtained in dry season, should the whole trade of the great lak be turned that way, is a matter worthy of conside tion.

Admitting, however, that the boat navigation w completed to the Falls, in Oswego river, and a s cient supply of water secured, it remains to enc whether it would be prudent to expend what may needful on the navigation between those Falls an lake.

It will be seen by the report of the surveyor hereunto annexed, that in this distance there is a descent of little less than one hundred feet, and that the circumstances are peculiarly unfavorable; so much so, that an intelligent practical man (Mr. Weston) formerly pronounced it impossible. That word, however, when used on occasions of this sort, must be understood as standing in relation to the means which can prudently be applied to the end.

In examining the amount of expenditure which prudence may justify, it is to be noted, that if the same boat which arrives at the upper end of the Falls, could after reaching Oswego, proceed on her voyage, it might be worth while to calculate whether the saving of time and expense in lading and unlading, would bear any rational proportion to the cost of completing that navigation; but that is not the case, and therefore it would be more advisable if the communication be deemed of sufficient importance to construct a rail-way.

This, according to the estimate of an intelligent and experienced man, (Mr. Latrobe) annexed to Mr. Secretary Gallatin's report on canals and roads, would cost about 10,000 dollars per mile; and by the aid of it, one horse could transport eight tons, supposing the angle of ascent not to exceed one degree.

But an angle of one degree will ascend in a mile upwards of ninety-two feet, or nearly as much as the difference of level in the whole twelve miles. If, then, two dollars be allowed for a horse, waggon and driver's wages, (with such return load as he can procure for his profit) and ten cents be allowed for the use of the rail-

way, and if it be supposed that only five tons be taken, instead of eight, the cost will be for each ton, the twelve miles, forty-two cents, or three and a half cents per mile; at which rate, one hundred and forty miles, (a greater distance than between Oswego and Lewiston, along lake Ontario) would come to four dollars, ninety cents, being thirty-five cents less than the freight now paid.

A question, however, of more importance, presents itself. Admitting that it were easy to complete a boat navigation from Rome to lake Ontario, and more difficult and expensive (in comparison) to effect a canal navigation to lake Erie, would it not be advisable to descend into lake Ontario, rather than encounter the difficulty and expense of the other course?

The Commissioners believe it would not; and without relying as they might, for support of their opinion on the comparative expense of transportation, (a topic which will find a better place elsewhere) it is sufficient to say, here, that articles for exportation, when once afloat on lake Ontario, will, generally speaking, go to Montreal, unless our British neighbors are blind to their own interest; a charge which ought not lightly to be made against a commercial nation.

Freight from Niagara to Oswego will, from the difficult and dangerous access to that harbor, be as high to the head of the rapids in the river St. Lawrence. The descent from thence to Montreal is less than the ascent from Oswego to Rome. It is true that the lake Ontario is estimated at one hundred and ninety-six feet above tide water, and the Rome level, only one

dred and eighty-four feet above the lake: but there is a considerable descent in the river St. Lawrence, in a distance of about seventy miles, to the lower end of the present sloop navigation, through which the current is sometimes strong. There is also a considerable descent from Montreal, in a distance of about thirty miles to tide water in the lake St. Peters. Perhaps it will be found that an average allowance of three inches per mile, (in the whole, upwards of twenty feet) is not too much, and that the river at Montreal is not one hundred and seventy feet below the upper surface of the gallot's rapids. In the distance of one hundred miles between these places, there are forty of still water, viz. about thirty in lake St. Francis, between the foot of Long Saut and the head of the Coteau du Lac rapid, and upwards of ten in the lake of the Two Mountains, between the foot of the cascade at the cedars, and the La Chine rapid.

Thus there will remain but sixty miles of canal, with an average fall of thirty-four inches per mile. The land descends proportionately to the water, so that there can be but little deep cutting; the soil is easy to dig; there are no streams or ravines of any consequence to cross; and there is an inexhaustible supply of pure water, which never varies much in its height, for any canal whatever.

Under circumstances so propitious, it is probable that a good sloop navigation from above the gallots, to Montreal, would cost less than a good boat navigation from Oswego to Rome. The extent of this last, deducting the Oneida lake, is fifty-six miles; the fall is

on an average near forty inches per mile; the sup
of water is doubtful, and in twelve miles of the c
tance, obstacles almost insurmountable, present the
selves.

These are facts, to which it would be in vain for
citizens of the United States to shut their eyes. T
eyes of a rich, enterprising commercial rival are op
and when it is considered that (if the means of easy
port be supplied to the inhabitants who may settle n
the great lakes) that country will, in no distant peri
furnish a more abundant stock of commodities for
reign trade, than is now sent from all the atlantic pc
of the union—it would be absurd to doubt, whetl
in the competition for that commerce, our neighb
will employ the means in their power. Nor mus
be forgotten, that the revenue which under pres
circumstances is raised from commerce, and which
probable change will reduce below an ad valorem d
of ten per cent, cannot but operate in favor of our
vals. True it is, that as far as regards the pecuni
benefit of those who may settle along the lakes,
route by which their products are sent abroad, a
their supplies of foreign articles introduced, must
to them a matter of little consequence. But the pol
cal connexion which would probably result fron
commercial connexion, certainly deserves the consi
ration of intelligent men.

The Commissioners have no doubt, that obstu
tions at the mouth of Oneida lake may be removed
as to lower the surface of that lake from eightee
ches to two feet, at no great expense, and with lit

any, injury to the navigation. But they have not been able to satisfy themselves that the lands contemplated in the petitions which the joint resolutions refer to, would be in any wise affected by operations at the mouth of Oneida lake. According to the information they have obtained, these lands are inundated by the waters of Butternut, Limestone, Chitenengo and Canaserago creeks, obstructed before their entrance into the lake.

In respect to an inland navigation direct from lake Erie to Hudson's river, the Commissioners beg leave to refer for information to the annexed reports and maps of Mr. James Geddes, employed at their request by the surveyor-general. From these it is evident that such navigation is practicable. Whether the route he sketched out will hereafter be pursued; whether a better may not be found—and other questions subordinate to these, can only be resolved at a future time, when an intelligent man, regularly bred to this business, shall, under the direction of those on whom the public may think proper to devolve the superintendence, have made a more extensive and careful scrutiny than the time and means of the Commissioners would permit. They conceive, however, that it may not be improper to say a few words on the topography of the country, which may be divided into three parts, nearly equal.

The Mohawk river, as is well known, runs in a deep ravine, and there is, generally speaking, along its banks a vale of rich soil. In different places, however, spurs from the neighboring hills project themselves to the

edge of the river. On the north side, fall in small streams, and two (the east and west creeks) which are large and copious, especially ter. They are both rapid, and run in deep On the right side, also, there are several t streams. The most considerable of these is th harie, which, rising among the Catskill mount scooped out, with its impetuous waters, a w deep ravine.

The stream next in importance, coming in f south, is the Oriskany, which is especially v because it enters the river not far from the level at Rome, and may, perhaps, become us feeder. This forms the first, eastern, or river d in which navigation, though defective, already In this division, with proper management, th be no defect of water for a boat canal, unless, in very dry seasons, at the summit level.

The second, middle, or lake division, exten the summit level westward to the outlet of the darque lake. In it, lie four lakes, the Otisko, teles, Owasco and Canandarque, higher than a which may be extended from lake Erie to the and furnishing a copious supply of water. Of largest lakes, the Seneca, encreased by a stre Crooked lake, lies nearly on the same level wit but the Cayuga much lower.

In this division, the turnpike road crosses h but they all terminate not far north of it, leavin deep valley, upwards of eighty miles long, fr to west, and about twenty wide from north

south east. If, indeed, the Cayuga lake, embosomed in a ravine which opens to the north on the valley, be considered as part of it, the breadth will be fifty miles. In this valley lie the Onondaga, Cross and Oneida lakes. It is bounded on the north, by a dividing ridge of land, which stretches from near the Gerundegat bay, eastwardly, to the neighborhood of Rome, where it joins the dividing ridge north of the Mohawk, between the waters of the St. Lawrence and those of the Hudson.

The third, western, or dry division, extends from the western boundary of the lake Division to lake Erie. In this, although the Genesee river runs through it, a want of water is already felt, and will daily become more sensible, as the country is cleared. The Genesee river, itself, is a torrent, which, however copious, or even superabundant it may be in the spring, is in the autumn almost dry. This tract of country, especially after passing the Flats of the Genesee, may, with little violence to the propriety of language, be called a plain: and here it may be proper to notice a peculiarity in the shape of the northern, and much of the western part of the state, which distinguishes it widely from the country lying south east of the mountains.

The descent from the dividing ridge, northward, is generally by a gradation of plains,* nearly horizontal. These, and the streams by which they are watered, have a similar, and, as it were, a simultaneous descent. Thus the rivers are but a kind of lakes, lying in plains,

* The word *plains* might lead into error. It is therefore proper to state that hills are scattered about, which vary the surface to the eye. But on examination, it will be found that, generally speaking, their bases are all on the same extended plain.

and communicating by falls and rapids with each other. These gradations have sometimes a small rise, immediately before descent; at other times, in ascending from one, we come immediately to the other. In no case is the peculiarity of shape more worthy of remark, than at the cataract of Niagara. In coming from lake Erie, where the sight cannot reach over the expanded surface, proceeding along the level bank of the Niagara river, to the head of the rapids immediately above the Falls, and thence pursuing a northern course, the traveller ascends but thirty-eight feet before he descends three hundred and forty-five to the plain in which lake Ontario is stretched out from east to west upwards of one hundred and sixty miles. The surface of lake Erie is three hundred and twenty-nine feet above that of lake Ontario, which being taken from the whole descent just mentioned, leaves for the rise of land between those two great reservoirs, but sixteen feet.

This rise, and others similar to it, are called by th inhabitants, the ridge, the ledge, the slope and the hi A more proper general appellation, perhaps, is, t steep, though occasionally by the elevation each w it becomes truly a ridge, or from the horizontal st of stone as, truly, a ledge. In some places the des is by a gentle slope, in others, more precipitous, an some, almost perpendicular. Two of these ext eastward from the shore of Niagara river nearly p lel to, and distant from each other about fourteen n The higher, or southern steep, commences at E Rock, where the river issues from lake Erie.

northern commences at the Falls, and after an eastern course of fifty or sixty miles, bends towards, and approaches the southern, after which they both take a southern direction for thirty miles, but return again on the east side of the Genesee: or to speak more correctly, that river, after breaking through them by successive falls of sixty and ninety feet, thirty miles south of the high road, in the township of Leicester, runs in a ravine to the northern part of that township; when the steeps again diverge, the southern stretching eastwardly to the west side of Seneca lake, and then southerly to the high grounds from whence flow the waters of the Tioga; while the other keeps an eastern direction to the hills from whose southern declivities flow the Chenango and Unadilla. There is another steep still more north, which branches out from that last mentioned, near the eighteen mile run, (a stream whose mouth is at that distance from that of the Niagara river) and diverging northward, is for some distance in its eastern progress indistinct. It extends, however, to the lower Falls of the Genesee, and is there crossed by that river, as also beyond it by streams, which fall into the Gerundegut bay; after which it becomes properly a ridge, and extends beyond the falls of Oswego river, as has been already mentioned. Of these three steeps, ledges, or ridges, the most southern is distinguished by lime-stone mixed with flint. The middle, by the same stone mixed with shells, and the most northern, by freestone and slate. Over the southern steep, west of the Genesee, fall Ellicot's brook and the Tanewanto, (which enter Niagara river by the

same mouth opposite to Grand Island) also, Allen's brook, which makes at its passage the Buttermilk Falls, and runs to the Genesee. Over the middle steep, in the same division, falls the Oak-orchard brook, which enters lake Ontario, about thirty miles east of Niagara river. The lower Falls of this brook, as well as those of the Genesee, are over the northern steep.

The Canesus, the Hemlock, the Honeyoyo, the Canandarque and the Crooked lakes, lie south of the southern steep. The Seneca, the Owasco, the Skeneateles and Otisco lakes, lie south of the middle steep. North of which, lie the Cayuga, Onondaga, Oneida and Cross lakes.

The Tonewanta falls over the southern steep twenty-five feet, and passing the village of the same name, runs in a level valley of brown clay upwards of twenty miles to its mouth in Niagara river.

From the Tonawanta village, north eastward, in less than five miles, (chiefly through a swamp) the Oak-orchard brook receives the waters of the swamp, and falls, as has been already mentioned, into lake Ontario. The Tonewanta brook, three feet higher than the swamp, is separated from it by ground, whose elevation is not more than five feet, the distance is short of a mile, and the soil being clay, it will be easy (by turning its waters into Oak orchard brook) to convert the Tonewanta from its mouth, upwards, into a canal. It has above eleven miles from its mouth, a depth of twelve feet, interrupted, nevertheless, by five bars, or shallows, composed of round stones, buried in clay. During this space, the breadth is in general forty yards,

though in the narrowest part not more than thirty. The first shallow, about three miles from the mouth, is called Miller's Ford, and is not above twelve yards wide; the next, about a mile beyond it, called Houses Shallow, extends east and west nearly one hundred and twenty yards, the debth of water from two and an half to three feet. Two miles further up, is Christman's Rapid. This extends east and west near two hundred and fifty yards, with a depth of from fifteen to eighteen inches: at this rapid, the fall is three inches, except when a westerly wind brings up the water of lake Erie. The breadth of the Tonewanta is here forty-eight yards, and no where below it less than forty.

The next bar, about a mile from the last, is called Van Slyke's Shallow; it extends forty-two yards, the depth in the shortest place twenty inches, but in general from two to three feet. The fifth and last bar, at eleven miles from the mouth of the creek, extends near one hundred and eighty yards, and has from one to two and an half feet of water.

To convert this water course into a canal twelve feet deep, during the whole distance of eleven miles, will require, at most, an excavation of eighty thousand cubic yards. The surface here is four inches higher than at the mouth, which is five feet lower than the surface of lake Erie. At about five miles and a quarter north from this place, in the middle steep, is the source of one branch of the eighteen mile brook, at a distance of about ten miles from lake Ontario, and about three hundred feet above its surface; consequently, near thirty feet below the surface of lake Erie.

The greatest elevation of ground between them is twenty-one feet above that surface; it is, however, on an average, for the space of three miles, twenty feet, and the remaining two miles and a quarter, about seven feet.

For a more particular knowledge of the ground, reference must be had to the profile made by Mr. Geddes, and which is hereunto annexed. It is self-evident, that the cost of excavation per cubic yard, must depend on the substance in which the excavation is made; it must depend, also, on some other circumstances. In deep cutting, for instance, not only must there be wide cutting to prevent the earth from falling in, but there will be, generally speaking, more labor, and consequently more expense in moving the earth after it is dug. It may become, therefore, in many cases, more advisable to pierce the earth by a tunnel, than to take down the top of a hill.

In the present instance, by means of wooden railways, which may be constructed from the surrounding forests for temporary purposes at a trifling expense, the materials may, when dug, be made, as it were, to transport themselves along by gentle declivities, to fill that part of the ravine through which the canal is to pass.

In the construction of canals when recourse is had (as must generally be the case) to rivers for a supply of water, it is found necessary to guard with scrupulous care, and, not unfrequently, at enormous expense, against those floods which, pouring a torrent into a canal, and tearing down its banks, might at once destroy the navigation and inundate the country.

Moreover, it is found, that canals depending on rivers, frequently, like the rivers themselves, want water in the season when it is most necessary. Indeed, to suppose the quantity of water in a river, when turned into a canal, will remain the same, would lead to serious disappointment. Much must be allowed for evaporation, and, notwithstanding the utmost care, more will filter through the sides and bottom of a canal, than those of a river, which are generally saturated.

Thus, then, two prominent evils present themselves in feeding from rivers, viz. In spring, they pour in too much water, and can afford none in autumn, when it is most wanted. There is still another evil, which, though not so imminent, becomes eventually of serious moment. When the country shall be cultivated, streams swoln by showers will bring down, mixed with their waters, a proportion of mud, and that, in the stillness of a level canal, will subside, and choak it up. It is also to be noted, by those who shall construct canals in this country, that the true character of a river cannot now be known. Large tracts, (for instance, west of the Genesee) which appear as swamps, and through which causeways of logs are laid for roads, will become dry fields, when no longer shaded (as at present) by forests impervious to the sun.

In the progress of industry, swamps (the present reservoirs of permanent springs that burst out on a lower surface) will be drained, whereby many of these springs will be dried. Of such as remain, a part will be used to irrigate inclined plains.

Moreover, in every place tolerably convenient, ponds will be collected for mills and other machinery, from whose surface, as well as from that of the soil, the sun will exhale an ample tribute of vapor.

Thus the summer supply of rivers will be in part destroyed, and in part consumed, whereby their present autumnal penury must be still farther enhanced. But in the spring, the careful husbandman and miller will open every ditch and sluice to get rid of that water which, though at other times a kind friend and faithful servant, is then a dangerous enemy and imperious master. Of course, much of what is now withheld for many days, will then be suddenly poured out. The torrents must therefore rage with greater fury hereafter than they do in the present day.

Considerations like these, while they cast a shade over many contemplated enterprises, give by contrast a glowing hue to that which we have now to consider. The canal from lake Erie to the Hudson, may be fed by pure water from lakes, provided mounds and aqueducts be made over intervening vallies, or the canal be carried round them. In every case the attending circumstances must decide.

In general, also, it is only after a more accurate examination of the ground by a skilful engineer, well practised in such business, that the best mode can be adopted for the species of navigation which may be ultimately determined on, viz. Whether for vessel which navigate Hudson's river and lake Erie, or for barges of from twenty to sixty tons.

If the passage were only of a few miles, the proprie-

of bringing vessels of eight feet draught of water across (if practicable) would be readily admitted. But it may well be questioned, whether, to save the expense of lading and unlading at each end of a canal three hundred miles long, the expense of cutting two yards deeper than would otherwise be necessary, ought to be encountered.

It has generally been assumed, and perhaps too lightly admitted, that canals should be made on a perfect level. This axiom would not be questioned, if the transportation each way, were of equal burden, if the distance or the frequency of good feeding streams were such as easily and constantly to supply, without danger of excess, the incessant waste of water by absorption, leakage and evaporation, and if the waters to be connected, were on the same level. But in a case like the present, rational doubts may be entertained. The difference of level being upwards of five hundred feet, all the descent which can prudently be obtained by an inclined plain, is so much saved in the expense of lockage; and in all human probability, the transportation, for centuries to come, will be of so much greater burden from the interior country, than back from the sea, that a current from the lake is more to be desired than avoided, more especially as it will in some degree counteract the effect of frost. That inexhaustible stream of limpid water which flows out of lake Erie, with little variation of height to endanger the canal, is a strong temptation to use it exclusively, until auxiliary supplies can be drawn from other reservoirs equally pure. Nor is it improper in this case to

remark, that it is impossible there should ever be considerable variation in the surface of Niagara riv at the mouth of the Tonewanta. No supposable of rain or melting of snow, even if both were to ta place at the same time, in the country which surroun the great lakes, could raise in any considerable deg their extended surface. Indeed, we know, from e perience, that a greater difference of elevation at t mouth of lake Erie is occasioned by a change of wi than by any variation of the seasons. Admittir however, a considerable rise of water, no matter fr what cause, at the source of Niagara river, it can suddenly, from the narrowness and shoalness of t channel, produce a correspondent rise at the foot of t Black Rock rapid; and the elevation there must, the nature of things, exceed that which is occasion by it fifteen miles lower down; more especially as t river, including the two channels round Grand Islan has for the greater part of the way nearly three tim the breadth which it has above. If, however, it we only a deep bay, the water pressed forward by the win would be piled up to a considerable height, but inste of that, the river here, with a breadth fully double what it has at Black-Rock, precipitates itself over t first ledge in its headlong course to the cataract: that an increase of height is instantly counteracted l the increased rapidity with which it rolls over the Ro

In all events, it would be advisable to use this wa exclusively for a great part of the way, even if t country afforded other resources; and to this effe there must be some descent in the canal. What t

precise amount of that should be, in every mile, the commissioners presume not to say. They do not pretend to sufficient knowledge on the subject, and with all proper deference, refer it to a practical engineer.

Nevertheless, like other men possessed of common discernment, they perceive not only that the quantity of water which runs in a given time, must be proportionate to the rapidity with which, and the aperture through which it passes; but also that the rapidity itself will depend not merely on the declivity, but also on the mass; because, in a deep and wide channel, the friction must be less than in one that is narrow and shoal. It will depend also on another circumstance, whose effect (that single cause remaining the same) will vary, according to such of the preceding circumstances as may be connected with it. Admitting, for instance, a stream to be deep and wide in descending an inclined plain its velocity will be accelerated. But if the inclination be not great, and the channel, shoal and narrow, the friction may so counteract the descent as to retard the velocity.

From these considerations it is evident that the sum of descent must depend primarily on the quantity of water required. This, in navigation ascending and descending by locks, must be greater than when carried along a plain. It must also be greater in a loose, than in a stiff soil. Moreover, the quantum of descent required must, after the needful supply of water is ascertained, depend on the length, the width, the depth, and finally on the course of the canal, whether direct or serpentine. And here the same common sense pre-

sents another important consideration. The amo
of rapidity which may with safety be hazarded will
pend on the texture of the substance through wh
the current passes. No navigable velocity can inj
a rock of granite; but a gentle current will sweep
the substance of bog meadow. In like manner, ba
which resist when the course is direct, may be ea
away, and the current itself be retarded, if propel
along a tortuous course.

The commissioners cannot, therefore, too often
peat that their report must be accepted as suggesti
proceeding from a superficial view, and not as conc
sions founded on sufficient and scientific investigati

After this preliminary caution, they assume hy
thetically that a canal were run in such manner,
that the average descent were six inches in every m
Whence, taking the surface of lake Erie as the st
dard level, they have in gross the following results

From lake Erie to

	Miles.	Descent.	Total descent.	Actual de
The mouth of Tanewanta,	10	5 feet	5 feet	5 fe
Genesee river, about	68	34 ,,	39 ,,	65 ,,
Seneca lake,	46	23 ,,	62 ,,	145 ,,
Cayuga lake,	6	3 ,,	65 ,,	195 ,,
Rome summit,	66	33 ,,	98 ,,	145 ,,
Little Falls of Mohawk,	38	19 ,,	117 ,,	203 1-2 / 245 1-2 ,,
Schoharie,	38	19 ,,	136 ,,	293 1-
Height of land between Schenectady & Albany,	24	12 ,,	148 ,,	220 ,,
Hudson's river,	14	7 ,,	155 ,,	525 ,,
	310			

Casting an eye on the map, it will be seen, that the first difficulty in the above course will be, to cross the Genesee at an elevation of twenty-six feet above its surface. But unless the canal be lowered down to that river, the expense of an aqueduct cannot be avoided; because from the upper falls, which are too high, there is little descent to the lower falls; and if, from any cause, it be advisable to cross it by an aqueduct, the addition of a feet in the height will not much increase the expense; indeed, considering the swell of the river in freshes, an elevation short of twenty feet would scarcely leave sufficient space under the arch.

The next difficulty will be in crossing the mouth of Seneca lake by an aqueduct eighty-three feet high. But this also, if a convenient place can be found, will not be important, because a moderate aperture will suffice to void the equable stream from that lake.

The third difficulty is at the mouth of Cayuga, where the elevation is one hundred and thirty feet. Even this might be encountered without any unusual hardihood, if the hills approached each other. But the valley to be crossed is not much, if any thing, short of a mile; and to erect a mound of that length and of the sufficient height and breadth, is an herculean labor. Whether it will be performed, must depend on the arm that undertakes this task, respecting which, a few words may find their proper place hereafter.

Supposing, however, that difficulty to be surmounted, it is believed that none will remain which cannot be, in a considerable degree, avoided by bending occasionally to the southward, and returning round the

northern points of the hills, till the canal is brought opposite to Rome. Its elevation there above the Mohawk will be forty-seven feet or less, by one foot for every two miles that it may be lengthened. The general face of the country here, leaves no room to doubt, that convenient ground can be discovered south of Rome, at an elevation of forty feet above the Mohawk. How far it may be practicable, between that place and the hills east of the Schoharie, must be decided by actual survey.

The elevation, if not in other respects injurious, will be useful in passes that might, otherwise, necessitate a descent to the Mohawk. Thus, at the Little Falls at that river, the canal, at an elevation of eighty feet above its upper surface, may, it is believed, be brought through or round the hill at no enormous expense. The still greater elevation of one hundred and fifty feet at the Schoharie, will permit of a considerable bend to find some narrow gorge, and finally an elevation of seventy feet above the height of ground between Schenectady and Albany, will enable the engineer to choose for the course of his canal and the position of his locks, the most suitable soil and convenient situations. In a word, if, on due examination, any thing of this sort should be found practicable, instead of depriving the country of water, every drop of which is needed by its inhabitants, they will gain a great addition from the canal; and as to the navigation, singly considered, there can be no doubt but it must in that way be superior to a waving course ascending and descending by locks. For, not to mention the expense

of constructing and keeping them in repair, the time spent and tolls paid in passing them, must considerably enhance the freight of goods. But if there be no lockage, and the toll be no more than is needful to keep the canal in repair, it will amount to so little as not to merit notice in a calculation of freight. Rejecting it, therefore, and allowing two horses and three men to take a boat of fifty tons burden, twenty miles a day, which is certainly within bounds, and putting the whole expense at five dollars on the lading, downward, (leaving the return load as profit) or, which is equivalent, reducing the distance one half, we have fifty tons transported ten miles for five dollars, being one cent per ton per mile. To speak, then, in round numbers, it will cost three dollars to bring a ton from lake Erie to Hudson's river, being little more than one half of what is now paid for freight on lake Ontario, between Oswego and Lewiston. Without entering into calculations (which every person can easily make for himself) to enumerate the bulky articles which will derive value from such facility of transportation, it may be proper in this place to recur again to the commercial competition with our British neighbors.

A tolerable good navigation up and down the St. Lawrence, already exists; but the cheapest rate at which transportation has been performed within the last ten years between Kingston and Montreal, according to the best information the commissioners have been able to obtain, is one dollar per hundred ascending, and half as much descending the river. But admitting the freight could be so reduced as to be on

a level with that between Albany and New-York; admitting, also, that the transportation across lake Ontario could be performed as cheaply as through the proposed canal, and even admitting that the risk on that lake, and of course the premium of insurance, were nothing, still it would follow, that transportation from the head of lake Ontario to Montreal, would cost as much as from the mouth of Tonewanto to New-York, leaving a preference to the latter of the cost of land carriage from Chippeway to Queenstown. Moreover, nature has given (other things being equal) a decided preference to the port of New-York. There are, generally speaking, six weeks of navigation from Albany, in the spring, before vessels can with safety leave Montreal to descend the river St. Lawrence, and as many more in the autumn, after the mouth of that river is closed.

The navigation from New-York, is seldom obstructed; so that produce deposited there, can be sent to market during five months, in which, at Montreal, it lies a dead weight on the hands of the owner. This circumstance is of especial importance in regard wheat and flower, which can be sent from New-York so as to be sold in the south of Europe, before the articles can be brought from the Baltic, or gathered the country: whereas, if shipped from Montreal in t month of May, they cannot reach Spain or Portug until after supplies are received from Dantzic, and b a short time before the harvest, which is early in Ju

Thus, it is evident that the canal will, if properly fected, turn to the United States the commerce of

upper lakes. Moreover, a side cut, of five or six miles, would, by means of locks, connect it with lake Ontario, in the harbor of the Genesee; and in like manner a connection would be established with the Seneca and Cayuga lakes, from the heads of which, the short portage by good roads to Newtown and Owego, opens a communication through the Susquehannah to the Chesapeake. Nor is it improbable, that by running up on the west side of the Cayuga, means may be found to establish water communication with the Susquehannah; from the great bend of which, a good and short road may be made to the Delaware.

Thus a variety of markets may be opened to stimulate and reward the industry of those who are now, or may be hereafter settled along the great lakes, whose shores, exclusive of lake Superior, are upwards of two thousand miles surrounded at convenient distance by more than fifty million acres of land.

To the question, what will the proposed canal cost? it is not possible to answer with any thing like precision. Indeed, preliminary points are to be adjusted; and of these, the first is, whether it is to be made for sloops or barges. The expense of the former will be, it is believed, at least double that of the latter. Another question, whether it is to be carried along an inclined plane, or by a line ascending and descending, must be decided by a comparison of the expense and of the utility each way. In general, however, it may be satisfactory to the honorable the senate and assembly, to receive the information which the commissioners feel no hesitation in giving, that, as far as they have been

able to extend their enquiry, there is no part of the civilized world, in which an object of such great magnitude can be compassed at so small an expense. Generally speaking, the course is through a tract of country, the excavation whereof will be easy, and there is at certain convenient distances from the spots where it may be wanted, a sufficiency of free stone as well as of lime stone, with a superabundance of fuel. The subsistence of men, also, and of cattle, will be abundant, and cheap. The wages of the former are, as is well known, high: but measures may certainly be devised to obtain the labor for so great a public work more cheaply than is practicable in private operations on a small scale. But the commissioners beg leave to observe, that no supposable expense can bear an undue proportion to the value of the work. Thus, were it (by giving a loose to fancy) extended to fifty millions of dollars, even that enormous sum does not exceed half the value of what, in all human probability, and at no distant period, will annually be carried along the canal. The more proper question, perhaps, is, in what time can it be effected; for if an annual sum be appropriated, and secured on a solid fund, it will be effecte in time, and the greater the sum, the shorter will t the period.

The Commissioners have no doubt but that goo bargains for the public may be made with those throu whose land the canal shall pass; and they have gr pleasure in stating, that generous offers have alre been made, by many proprietors, the acceptance which must necessarily be deferred to the mom

when the business assuming a more substantial form, shall be committed to superintendents duly authorised to treat. Enough has been said to shew that no accurate estimate of the expense can as yet be made. To give some general notion, however, it may be assumed that, in common cases, laborers ought to dig and remove to a reasonable distance, eight cubic yards per day. The excavation may therefore be set at the eighth of a dollar per cubic yard. An average breadth of fifteen yards, and depth of one yard, which by means of the mound on each side will be sufficient for four and a half to five feet of water, giving for each yard in length fifteen cubic yards, may therefore be taken at two dollars, and the mile at 3520 dollars: but allowing for the obstructions of trees and roots, not less than 4000 dollars. This gives for 300 miles, one million, two hundred thousand dollars. The excavation needful to bring a column of water fifteen yards wide, and two yards deep, with sufficient descent from the Tonewanto, through the middle steep, will at the same rate cost two hundred and fifty thousand dollars. Thus, to speak in round numbers, the canal, alone, might cost a million and a half, drawn through a favorable soil, lying conveniently without the opposition of rocks or other impediments. Many of these, however, must be expected, and will, perhaps, double that sum. Another great expense is that of locks and aqueducts. It is said that the former will cost at the rate of one thousand dollars per foot of ascent for a vessel of fifty tons. This is believed to be a low estimate. At any rate, in a canal like the present, there must be a double set;

one for the ascending, and one for the descending navigation. Even then it is to be feared, that there will be much of embarrassment and delay. Thus the lockage being taken at two thousand dollars per foot, for three hundred and forty feet of descent and ascent, between lake Erie and Rome, will cost six hundred and eighty thousand dollars, should that waving course be deemed advisable. From Rome to Hudson's river, a descent of three hundred and eighty feet, will call for an addition of seven hundred and sixty thousand dollars.

If, then, the locks be put at a million and a half, it is the lowest rate which can prudently be supposed. It would, indeed, be safer to set them at two millions. There will still remain for aqueducts, embankments and mounds, a considerable expenditure, which cannot at present be ascertained. To estimate the expense of aqueducts, it may be advisable to put the cubic yard of masonry at two dollars, and consider the aqueduct as a solid mass. It is true, that not more, perhaps, than one third of the materials required for a solid mass will be used, but the workmanship on those materials will be much more costly. Many of the stones must be hewn, and many clamped together with iron. Moreover, the expense, when such buildings are raised to a great height, is proportionately greater than when nearer the earth. An aqueduct over the Genesee may perhaps be one hundred and fifty yards long. But to avoid mistakes, it will be more advisable to suppose two hundred. The height above mentioned is twenty-six feet. But as well to obviate mistakes, as

for convenience of calculation, it may be taken at ten yards, and in order to preserve the full breadth of the canal, the aqueduct may be considered as twenty yards wide. Thus we have a result of forty thousand cubic yards of masonry, which at two dollars, will require an expenditure of eighty thousand dollars. A remark which will not escape the most cursory observer, is, that a single set of locks to ascend and descend five and twenty feet, will cost fifty thousand dollars, at the lowest estimation; and on the system of level canals, the descent in this case is sixty-five feet. Excepting the Genesee, no considerable aqueduct will be needful; because the streams from the lakes being equable, small arches may be turned over them, and the canal be carried along a mound of earth. The expense of such mound must depend on the convenience of obtaining materials. Where hills of sufficient elevation in the neighborhood give the advantage of running along wooden rail-ways, or where the transportation may be by boats, along the canal itself, a mound will cost but little, compared to that which is raised solely by the labor of men and cattle. All estimates, therefore which are not founded on exact local knowledge, must be vague and uncertain. Assuming, however, as a basis, the price of one dollar for eight cubic yards; to estimate the expense of a mound over the Cayuga lake, one hundred and thirty feet high, and sixty feet wide, on the top, with an inclination of five and forty degrees, in the descent of the side, we have at the base one hundred and ninety feet, giving a mean width of one hundred and twenty-five; which, multiplied by

the height one hundred and thirty, is sixteen thousand two hundred and fifty feet, or in round numbers, one thousand eight hundred square yards. These, at the eighth of a dollar each cubic yard, will cost for every yard of the mound in length, two hundred and twenty five dollars. Allowing, therefore, two thousand yards instead of a mile, so as to compensate for the expense of an arch two hundred feet long, with a span of fifty feet over the stream, and for other contingencies, the whole cost might be four hundred and fifty thousand dollars, perhaps half a million.

Under the impresssion resulting from these observations, it is believed that one million of dollars would provide for every thing of this sort, so as to bring the canal to a reservoir near Hudson's river without locks, for four millions of dollars: a descent there, of from three to four hundred feet by locks, would cost, perhaps, another million; or if it should be deemed more advisable to transport by rail-ways, the water used for machinery would probably yield a rent sufficient to keep the canal in repair.

But hitherto, this navigation has been contemplated no further than to the mouth of Tonewanta, in Niagara river. From thence to lake Erie, is ten miles and the last mile, at the Black Rock rapid, is said to have, through part of a fall which is, on the whole, four feet, a rapidity of near seven miles an hour; so that vessels descending below it, may wait a whole season for wind sufficiently strong to get up.

This obstacle, though great, does not appear insurmountable. Perhaps two wharves, similar to tho:

which surround our cities, made impervious to the water, and sunk parallel to each other during the distance of one mile, with two pair of gates similar to those of dry docks, placed so as that the upper one being shut, there shall be still water from below; and that the lower one shut, will make still water above, may fully answer the end. The cost, where wood and stone are so abundant, cannot be great; and as wood is not liable to rot under water, nor exposed in fresh water to the ravages of worms, the work may be sufficiently durable. On the whole, it is conceived that the expense of this national work may be five millions of dollars; a sum which does not, it is presumed, exceed five per cent of the value of the commodities, which, in less than a century, it will annually transport, should it be now commenced, so as duly to encourage population around the upper lakes.

The commissioners hope they shall be excused if, in this place, they advert to a question more important, perhaps, than any other. By whom shall the needful expense be supported?

They take the liberty of entering their feeble protest against a grant to private persons or companies. Too great a national interest is at stake. It must not become the subject of a job, or a fund for speculation. Among many other objections there is one insuperable: That it would defeat the contemplated cheapness of transportation. It should always on occasions of this sort be recollected, that the reasons adduced for grants to individuals in Europe apply inversely here. Few of our fellow citizens have more

money than they want, and of the many who want, few find facility in obtaining it. But the public can readily, at a fair interest, command any reasonable sum. Moreover, such large expenditures can be more economically made under public authority, than by the care and vigilance of any company.

It remains therefore to determine whether this canal should be at the cost of this state or of the Union. If the state were not bound by the federal band with her sister states, she might fairly ask compensation from those who own the soil along the great lakes for the permission to cut this canal at their expense; or her statesmen might deem it still more advisable, to make the canal at her own expense, and take for the use of it, a transit duty; raising or lowering the impost, as circumstances might direct for her own advantage. This might be the better course if the state stood alone. But fortunately for the peace and happiness of all, this is not the case; we are connected by a bond, which, if the prayers of good men are favorably heard, will be indissoluble. It becomes proper, therefore, to resort for the solution of the present question, to principles of distributive justice. That which presents itself, is the trite adage, that those who participate in the benefit, should contribute to the expense.

The commissioners presume not to go one step farther. The offers of individuals, already alluded to, shew their conviction of that equity by which the state is called on for her share. The wisdom as well as justice of the national legislature, will, no doubt,

lead to the exercise on their part of prudent munificence; but the proportion, the conditions, the compact in short, must be the result of treaty. Whether the honorable the senate and assembly will take steps towards a negociation, and what these steps may be, it is in their wisdom to determine.

All which is respectfully submitted,

GOUV. MORRIS,
S. V. RENSSELAER,
W. NORTH,
DE WITT CLINTON,
THOMAS EDDY,
PETER B. PORTER,
SIMEON DE WITT.

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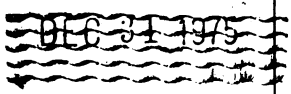
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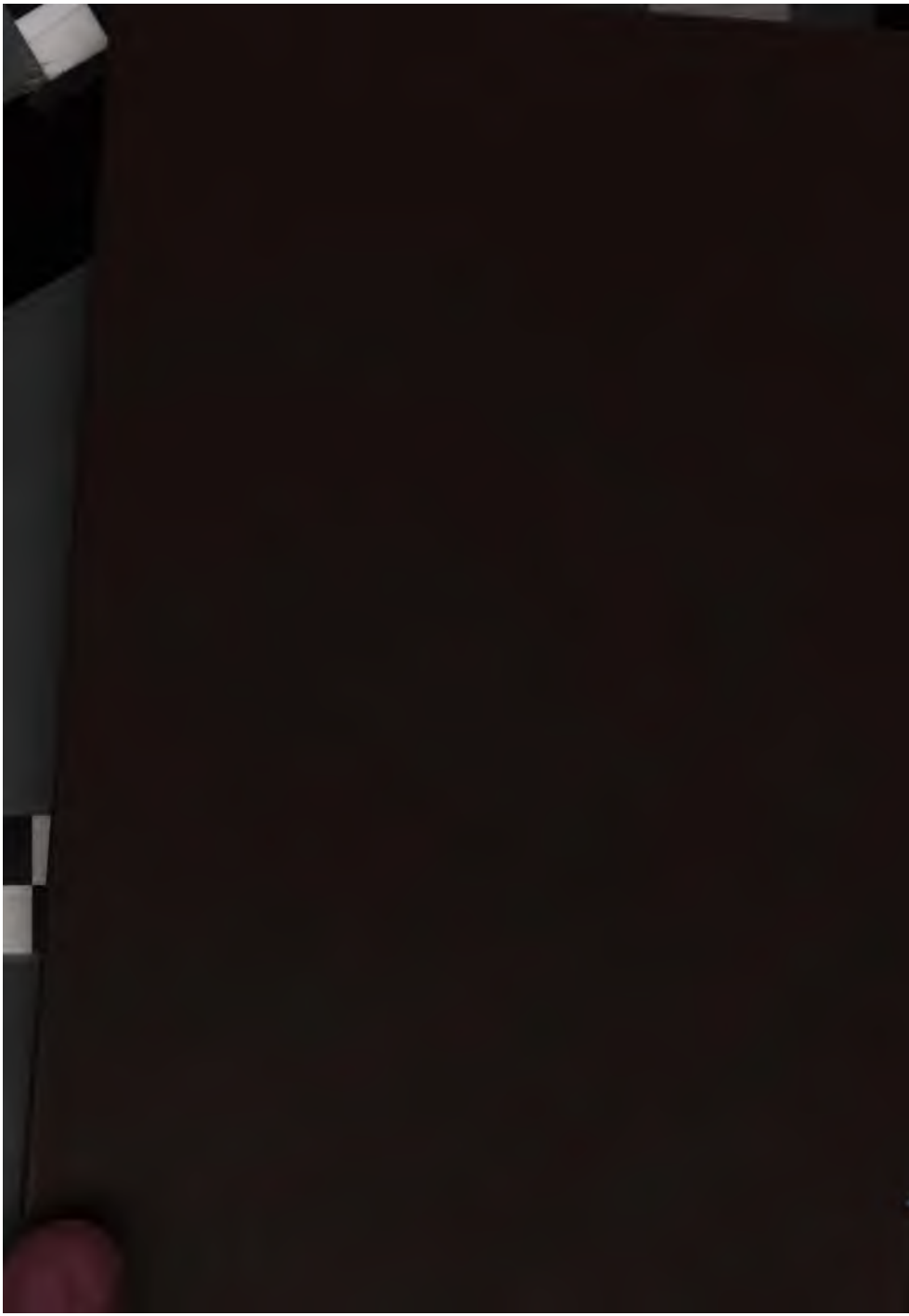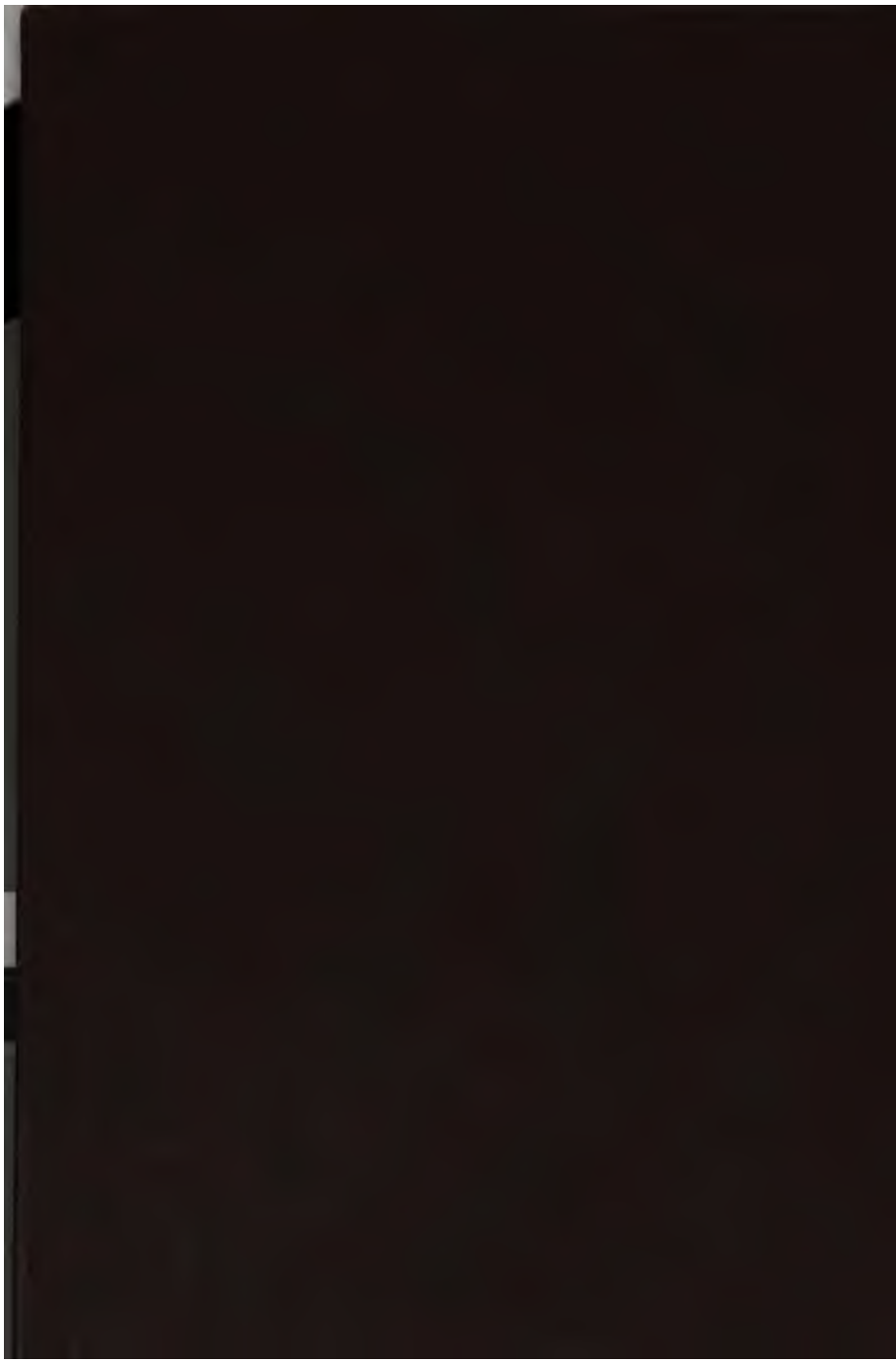
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